

PERFORMANCE REPORT

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FEDERAL AID IN SPORT FISH RESTORATION ACT

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FEDERAL AID PROJECT F-30-R-34

STATEWIDE FRESHWATER FISHERIES MONITORING AND MANAGEMENT PROGRAM

2008 Survey Report

**Amon G. Carter Reservoir**

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July 31, 2009

## TABLE OF CONTENTS

|  |      |
|--|------|
| Survey and management summary .....  | 2    |
| Introduction.....  | 3    |
| Reservoir description.....   | 3    |
| Management history.....  | 3    |
| Methods.....   | 4    |
| Results and discussion.....  | 4    |
| Fisheries management plan.....   | 6    |
| Literature cited.....  | 7    |
| Figures and Tables.....  | 8-23 |
| Water level (Figure 1).....  | 8    |
| Reservoir characteristics (Table 1) .....  | 8    |
| Harvest regulations (Table 2).....   | 8    |
| Stocking history (Table 3).....  | 9    |
| Habitat survey (Table 4) .....   | 10   |
| Percent directed angler effort (Table 5) .....   | 10   |
| Gizzard shad (Figure 2).....   | 11   |
| Bluegill (Figure 3) .....  | 12   |
| Channel catfish (Figure 4 & 5; Table 6) .....  | 13   |
| White bass (Figure 6 & 7; Table 7) .....   | 15   |
| Largemouth bass (Figure 8 & 9; Table 8) .....  | 17   |
| White crappie (Figure 10 & 11; Table 9) .....  | 19   |
| Black crappie (Figure 12 & 13; Table 10).....  | 21   |
| Fishing effort and directed expenditures (Table 11).....                               | 23   |
| Proposed sampling schedule (Table 12).....   | 23   |
| Appendix A: Catch rates for all target species from all gear types.....                | 24   |
| Appendix B: Map of 2008-2009 sampling locations .....                                  | 25   |
| Appendix C: Historical catch statistics 1992-2009 .....                                | 26   |
| Appendix D: Supplemental largemouth bass electrofishing and aging, November 2005 ..... | 27   |

## SURVEY AND MANAGEMENT SUMMARY

Fish populations in Amon G. Carter Reservoir were surveyed in 2008 using an electrofisher and trap nets and in 2009 using gill nets. Habitat was surveyed in 2008. A creel survey was conducted from December 2007 to November 2008 as part of an investigation of exploitation of largemouth bass. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir description:** Amon G. Carter Reservoir is a 1,848-acre impoundment on Big Sandy Creek in Montague County. Water level was below conservation level (920 ft-msl) most of the time from June 2005 until May 2009. The reservoir waters are moderately rich in nutrients. Habitat features consisted mainly of rip-rap, rocky shoreline, boulders, native emergent aquatic vegetation, and dead standing timber.
- **Management history:** Important sport fish include channel catfish, white bass, largemouth bass, and white crappie. The management plan for the 2005 survey report included a recommendation to investigate best-fit largemouth bass regulation using age and growth data, conduct creel survey, conduct a public scooping meeting, monitor growth of hydrilla, and execute updates of angler information. In 1966 - 1972, 101,000 advanced channel catfish fingerlings were stocked. In 1971 and 1985, 75,060 northern largemouth bass were stocked. An estimated 485,761 Florida largemouth bass were stocked from 1982 – 1985, 2000, and 2001. Beginning in 1978, 9,125 adult threadfin shad were stocked and continued into 1980, 1984, 1985, and 2003.
- **Fish community**
  - **Prey species:** Electrofishing catch rate of gizzard shad was the lowest on record; however, the void was filled by threadfin shad. The relative abundance of prey-size gizzard shad ( $\leq 7$ -inches) was only modest. Electrofishing catch rate of bluegill remained good.
  - **Channel catfish:** Gill net catch rate of channel catfish was average. Most of the population was legal size and in fair condition. Growth was slow, but recruitment of legal-size fish was excellent.
  - **White bass:** Gill net catch rate of white bass was high, most of the catch was legal-size fish and body condition was good. Recruitment of legal-size fish was excellent.
  - **Largemouth bass:** Electrofishing catch rate of largemouth bass was near the historical average, but few were legal size. Recruitment of small fish was excellent, which was encouraging for future angling. Data suggested overfishing of predators. Condition and growth were good.
  - **Crappie:** Trap net catch rate of white crappie was above the historical average. Fewer legal-size white crappie were collected as compared to previous years. Recruitment, growth, and condition were good.

Trap net catch rate of black crappie increased since the last survey and remained above the historical average. Fewer legal-size black crappie were collected as compared to previous years. Recruitment and condition were excellent, but growth was slow.
- **Management strategies:** Based on current information, Amon G. Carter Reservoir should continue to be managed with existing fish harvest regulations, pending results of an investigation of exploitation of largemouth bass.

## INTRODUCTION

This document is a summary of fisheries data collected from Amon G. Carter Reservoir in 2008–2009. A creel survey was conducted from December 2007 to November 2008 as part of an investigation of exploitation of largemouth bass. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other species of fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2008–2009 data for comparison.

### *Reservoir Description*

Amon G. Carter Reservoir is a 1,848-acre impoundment on Big Sandy Creek in Montague County. It was constructed in 1956 by the City of Bowie for municipal and industrial uses. The reservoir drains approximately 111 square miles and has a shoreline of 22.5 miles. Approximately 55% of the reservoir is  $\leq 15$  feet deep. Water level was below conservation level (920 ft-msl) most of the time from June 2005 until May 2009 (Figure 1). With a TSI chl-*a* of 45.18, Amon G. Carter Reservoir was mesotrophic and borderline eutrophic (Texas Commission on Environmental Quality 2008). A TSI chl-*a*  $>45$  and  $<55$  is considered eutrophic; hence, the reservoir is moderately rich in nutrients with moderate productivity. The average depth is 13 feet with a maximum depth of 50 feet. Habitat features consisted mainly of rip-rap, rocky shoreline, boulders, native emergent aquatic vegetation, dead standing timber, and a few boat docks. Boat access consisted of two public boat ramps with parking, boarding pier, and ample illumination. Most of the perimeter is privately owned; hence, bank access is primarily adjacent to the boat ramps. Further information about Amon G. Carter Reservoir and its facilities can be obtained by visiting the Texas Parks and Wildlife Department (TPWD) web site at [www.tpwd.state.tx.us](http://www.tpwd.state.tx.us) and navigating within the fishing link. Other descriptive characteristics for Amon G. Carter Reservoir are in Table 1.

### *Management History*

**Previous management strategies and actions:** Management strategies and actions from the previous survey report (Hysmith and Moczygemba 2005) included:

1. Plan, organize, and conduct an age and growth study to identify the best-fit largemouth bass regulation for Amon G. Carter Reservoir in fall 2005.  
**Action:** We collected 530 largemouth bass and aged 257  $\geq 6$  inches (Appendix D). Evidence was inconclusive for a best-fit largemouth bass regulation. Recommended additional study before deciding which regulation would be best.
2. Conduct a creel survey to determine largemouth bass catch statistics and angler attitudes.  
**Action:** An 18-day roving creel survey was conducted March – May, 2006. Results indicated a tournament catch to non-tournament harvest ratio of 4.7:1 (61 tournament caught fish and 13 non-tournament harvested fish). A nine day roving creel was conducted in spring 2003 which had a tournament catch to non-tournament harvest ratio of 19:1 (76 tournament caught fish and 4 non-tournament harvested fish). Allen et al. (2004) concluded that ratios three or greater could indicate problems related to over exploitation by tournament anglers. The angler attitude survey indicated 48% of the anglers interviewed preferred the 14-inch minimum statewide largemouth bass harvest regulation, 27% preferred a slot length limit, and 25% had no opinion.
3. Conduct a public scoping meeting by summer of 2006.  
**Action:** Due to results from the creel and attitude and opinion surveys we concluded inconclusive and insufficient information; therefore, no scoping meeting was held. Fisheries management programs discussing current and historic data related to Amon G. Carter Reservoir were presented to the membership of two bass clubs in Bowie.
4. Based on findings of the above strategies determine appropriate largemouth bass regulation and, if needed, request a regulation change.  
**Action:** Findings were inconclusive and no regulation change was requested.

5. Monitor the growth of hydrilla annually.

**Action:** Hydrilla was first observed in 1995 at a public boat ramp located off of FM 1125. Periodic observations since 1995 have seen some hydrilla growing up Kiel Creek and hydrilla is still present at the FM 1125 boat ramp. The only concentrated areas of hydrilla have been at the FM 1125 boat ramp. Monitoring of the hydrilla is ongoing.

6. Changes in existing fishing opportunities need to be communicated to the public.

**Action:** Updated webpage as necessary.

**Harvest regulation history:** Sport fishes in Amon G. Carter Reservoir are currently managed with statewide regulations (Table 2).

**Stocking history:** Amon G. Carter Reservoir was last stocked with fingerling Florida largemouth bass in 2001. The entire stocking history can be seen in Table 3.

**Vegetation/habitat history:** Amon G. Carter Reservoir supported mostly native emergent aquatic vegetation and some non-native hydrilla (Table 4). Habitat features consisted mainly of rip-rap, rocky shoreline, boulders, native emergent aquatic vegetation, dead standing timber, and a few boat docks.

## METHODS

Fishes were collected by electrofishing (1 hour at 12 5-min stations), gill netting [5 net nights (nn) at 5 stations], and trap netting (5 nn at 5 stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing and, for gill and trap nets, as the number of fish caught per net night (fish/nn). All survey sites were randomly selected and all surveys were conducted according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2008).

Sampling statistics (CPUE for various length categories), structural indices [Proportional Stock Density (PSD), Relative Stock Density (RSD)], and condition indices [relative weight (Wr)] were calculated for target fishes according to Anderson and Neumann (1996). Index of vulnerability (IOV) was calculated for gizzard shad (DiCenzo et al. 1996). Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE statistics and for creel statistics and SE was calculated for structural indices and IOV. Otoliths, for aging channel catfish, white bass, largemouth bass, white crappie and black crappie, were extracted from the auditory capsules in the neurocranium, washed to remove all adhering tissues, dried, and stored for further analysis according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2008). Ages were determined using Tier 2 protocol according to the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2008). The manual specifies procedures for largemouth bass only, but we adapted the protocol to other target fishes for identifying the number and size(s) of target fish to sample. The source for water level data was the United States Geological Survey website.

A 72-day (four quarter) roving creel survey was conducted over a 12-month period from December 2007 to November 2008. Interviews were conducted on 40 weekend days and 32 weekdays, to assess angler use and fish catch/harvest rate in accordance with the Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual revised 2008). The creel survey was in conjunction with the study, *Largemouth bass exploitation in Amon G. Carter Reservoir, Texas: Would changing harvest regulations be successful?* by Bruce Hysmith and John Moczygemba.

## RESULTS AND DISCUSSION

**Habitat:** Littoral zone habitat consisted primarily of rip-rap, rocky shoreline, boulders, native emergent aquatic vegetation, dead standing timber, non-native hydrilla, and a few boat docks (Table 4).

**Prey species:** Electrofishing CPUE of gizzard shad and bluegill were 65.0/h and 305.0/h, respectively (Figures 2 and 3). The catch rate of gizzard shad was the lowest on record (Appendix C). Index of vulnerability (IOV) for gizzard shad indicated around 50% of gizzard shad were available to existing predators (Figure 2). Bluegill  $\leq 4$  inches represented 79% of the sample population with a PSD of six (Figure 3). Total CPUE for threadfin shad was 575.0/h which was an all-time record and served to augment the prey base (Appendix C).

**Channel catfish:** Gill net CPUE of channel catfish was 4.6/nn, similar to 2005 (Figure 4) and near historic average (Appendix C). Relative weights of channel catfish increased with size. Growth was average; 12 inches in 4-5 years ( $N = 5$ ). Recruitment was evident and 82% of the sample population was legal size and larger. The third most sought-after sportfish (Table 5), anglers harvested an estimated 3,794 channel catfish (Table 6). The average size harvested was 14 inches and we observed non-compliance of harvest regulations (Figure 5).

**White bass:** Gill net CPUE of white bass was 11.0/nn (Figure 6), highest on record (Appendix C). An estimated 82% of the sample population was  $\geq 10$  inches, recruitment was evident, and relative weight was good. White bass grew 10 inches in 2 years ( $N = 11$ ; all 2-year olds). White bass were not found in Amon G. Carter Reservoir until 1995 (Appendix C). Anglers harvested an estimated 5,482 white bass with an average length of 12 inches (Figure 7). Total catch per hour was 3.22 (Table 7).

**Largemouth bass:** Electrofishing CPUE for largemouth bass (105.0/h) has declined consistently since 2004 (Figure 8), but remains close to the historic average (Appendix C and D). Relative weight was very good suggesting healthy fish. Largemouth bass grew 14 inches in 1-4 years ( $N = 257$ ; Appendix E). Despite the presence of a 22-inch largemouth bass in the growth sample, calculated maximum length based on the von Bertalanffy growth equation should be 21.2 inches. The lack of big largemouth bass in the population was evident. Of the 787 largemouth bass tagged for the ongoing exploitation study, most were 12 to 15 inches (Appendix F). This suggests the population would benefit from protecting large bass with a more restrictive regulation. The most sought-after sportfish (Table 5), anglers harvested an estimated 2,811 largemouth bass with an average length of 15.5 inches (Figure 9). Total catch per hour was 0.60 (Table 8) and we observed angler non-compliance.

Preliminary results from the ongoing exploitation study indicated a ratio of 13.4 tournament-caught to non-tournament-harvested largemouth bass. According to Allen et al. (2004), a ratio of three or greater could suggest problems with overexploitation by tournament anglers. Data from an on-going exploitation study are currently being analyzed and will be available in December 2009.

**Crappie:** Trap net catch rate of white crappie was 10.8/nn, lower than in 2004 (Figure 10) but in-line with historic averages (Appendix C). Relative weights for white crappie indicate they are in good condition. Growth was good, 10 inches in 2 years ( $N = 8$ ; all 2 years old). About 16% of the sample population was  $\geq 10$  inches. White crappie was the second most sought-after sportfish (Table 5). Anglers harvested 12,368 white crappie (Table 9) averaging 11 inches (Figure 11). We observed angler non-compliance.

Trap net catch rate of black crappie was 2.0/nn, an increase over the 2004 sample, but similar to 2000 (Figure 12). Relative weights reflected fair to good body condition, there was evidence of recruitment, and growth was good. Anglers harvested 1,628 black crappie (Table 10) averaging 11 inches (Figure 13). We observed angler non-compliance.

**Creel Survey:** Total fishing effort for all species and total directed expenditures are presented in Table 11.

**Fisheries management plan for Amon G. Carter Reservoir, Texas**

Prepared – July 2009.

**ISSUE 1:** Preliminary results from the ongoing exploitation study indicated a ratio of 13.4 tournament-caught to non-tournament-harvested largemouth bass. According to Allen et al. (2004), a ratio of three or greater suggests problems with overexploitation by tournament anglers. The data are currently being analyzed and will be available in December 2009.

**MANAGEMENT STRATEGIES**

1. Analyze data from the exploitation study and use that information to model the effects of various regulations to determine the best management strategy for Amon G. Carter Reservoir.

**SAMPLING SCHEDULE JUSTIFICATION:**

The proposed sampling schedule consists of mandatory monitoring in 2012/2013 (Table 12).

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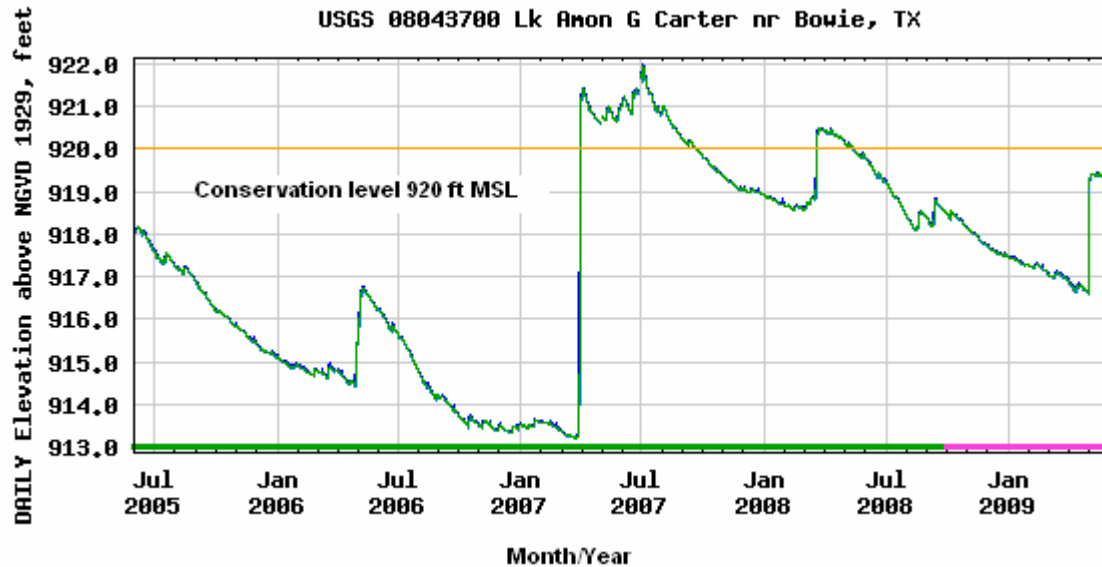


Figure 1. Monthly average water level elevations in feet above mean sea level (MSL) recorded for Amon G. Carter Reservoir, Texas, June 2005 - May 2009.

Table 1. Characteristics of Amon G. Carter Reservoir, Texas.

| Characteristic              | Description       |
|-----------------------------|-------------------|
| Year constructed            | 1956              |
| Controlling authority       | City of Bowie     |
| County                      | Montague          |
| Reservoir type              | Offstream         |
| Shoreline development index | 4.9               |
| Conductivity                | 280 $\mu$ mhos/cm |

Table 2. Harvest regulations for Amon G. Carter Reservoir.

| Species   | Bag Limit                       | Length Limit (inches) |
|---|---------------------------------|-----------------------|
| Catfish: channel and blue catfish, their hybrids and subspecies | 25<br>(in any combination)      | 12 minimum            |
| Catfish, flathead   | 5                               | 18 minimum            |
| Bass, white   | 25                              | 10 minimum            |
| Bass, spotted   | 5                               | No limit              |
| Bass, largemouth  | (black bass in any combination) | 14 minimum            |
| Crappie: white and black crappie, their hybrids and subspecies. | 25<br>(in any combination)      | 10 minimum            |

Table 3. Stocking history of Amon G. Carter Reservoir, Texas. Life stages are fry (FRY), fingerlings (FGL) advanced fingerlings (AFGL), adults (ADL) and unknown (UNK). Life stages for each species are defined as having a mean length that falls within the given length range. For each year and life stage the species mean total length (Mean TL; in) is given. For years where there were multiple stocking events for a particular species and life stage the mean TL is an average for all stocking events combined.

| Species                 | Year  | Numbe  | Life Stage | Mean TL (in) |
|-------------------------|-------|--------|------------|--------------|
| Channel catfish         | 1966  | 8,00   | AFGL       | 7.9          |
|                         | 1969  | 40,00  | AFGL       | 7.9          |
|                         | 1970  | 25,00  | AFGL       | 7.9          |
|                         | 1971  | 23,00  | AFGL       | 7.9          |
|                         | 1972  | 5,00   | AFGL       | 7.9          |
|                         | Total | 101,00 |            |              |
|                         |       |        |            |              |
| Florida Largemouth bass | 1982  | 77,53  | FGL        | 2.0          |
|                         | 1983  | 36,98  | FGL        | 2.0          |
|                         | 1984  | 101,93 | FGL        | 1.7          |
|                         | 1985  | 56,00  | FRY        | 1.0          |
|                         | 2000  | 106,50 | FGL        | 1.4          |
|                         | 2001  | 106,81 | FGL        | 1.5          |
|                         | Total | 485,76 |            |              |
| Largemouth bass         | 1971  | 75,00  | UNK        | UNK          |
|                         | 1985  | 6      | ADL        | 10.4         |
|                         | Total | 75,06  |            |              |
| Threadfin shad          | 1978  | 80     | ADL        | 2.9          |
|                         | 1980  | 1,80   | ADL        | 2.9          |
|                         | 1984  | 1,50   | ADL        | 2.0          |
|                         | 1985  | 4,10   | ADL        | 2.0          |
|                         | 2003  | 92     | ADL        | 4.0          |
|                         | Total | 9,12   |            |              |

Table 4. Survey of littoral zone and physical habitat types, Amon G. Carter Reservoir, Texas, 2008. A linear shoreline distance (miles) was recorded for each habitat type found. Surface area (acres) and percent of reservoir surface area was determined for each type of aquatic vegetation found.

| Shoreline habitat type      | Shoreline distance |                  | Surface area |                                   |
|-----------------------------|--------------------|------------------|--------------|-----------------------------------|
|                             | Miles              | Percent of total | Acres        | Percent of reservoir surface area |
| Riprap                      | 2.3                | 10.2             |              |                                   |
| Rocky shore                 | 2.4                | 10.8             |              |                                   |
| Boulders                    | 4.2                | 18.7             |              |                                   |
| Rock bluff                  | 0.5                | 2.2              |              |                                   |
| Bulkhead                    | 0.2                | 0.9              |              |                                   |
| Native submerged vegetation | <0.1               | <0.1             | <0.1         | <0.1                              |
| Native emergent             | 6.0                | 26.7             | 40.9         | 2.2                               |
| Hydrilla                    | <0.1               | <0.1             | <0.1         | <0.1                              |
| Boat docks                  | 0.4                | 1.8              | 2.4          | 0.1                               |
| Dead trees                  | 6.4                | 28.5             | 556.8        | 30.1                              |

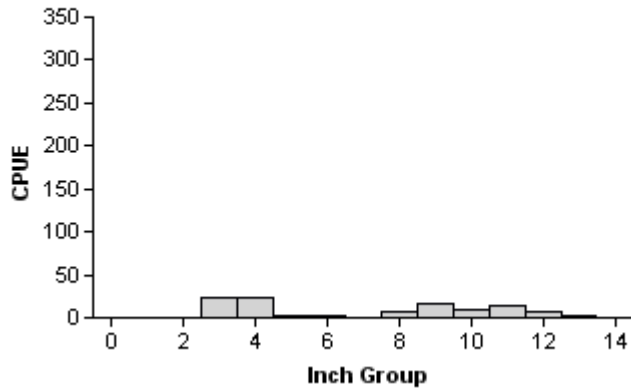
Table 5. Percent directed angler effort by species for Amon G. Carter Reservoir, Texas, December 2007 – November 2008.

| Species         | Year<br>2007/2008 |
|-----------------|-------------------|
| Channel catfish | 16.5              |
| White bass      | 2.6               |
| Sunfishes       | 1.6               |
| Largemouth bass | 41.3              |
| White crappie   | 16.8              |
| Anything        | 21.2              |

## Gizzard Shad

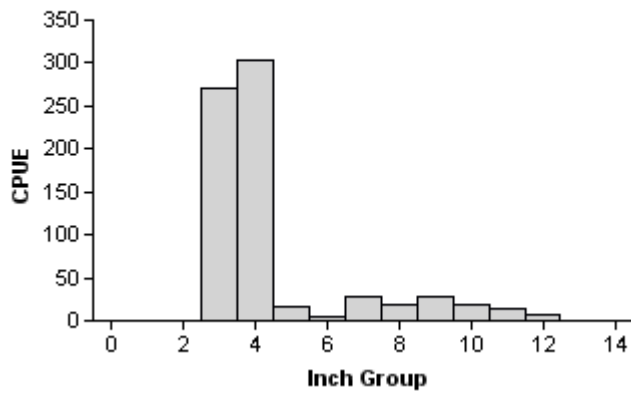
**2000**

Effort : 1.0  
 Total CPUE : 111.0 (27; 111)  
 PSD : 42 (4.6)  
 IOV : 49.5 (19.8)



**2004**

Effort : 1.0  
 Total CPUE : 709.0 (80; 709)  
 PSD : 19 (5.9)  
 IOV : 88.0 (9.0)



**2008**

Effort : 1.0  
 Total CPUE : 65.0 (26; 65)  
 PSD : 31 (10)  
 IOV : 50.8 (9.3)

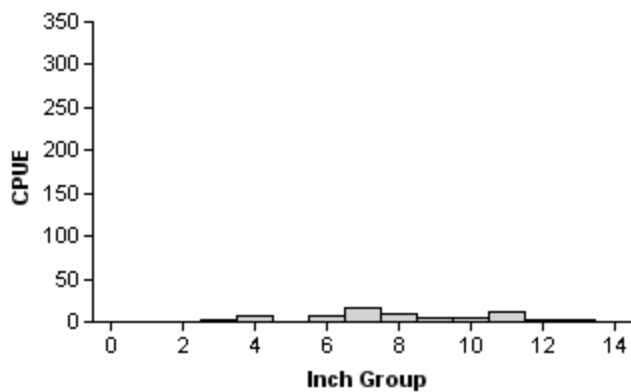
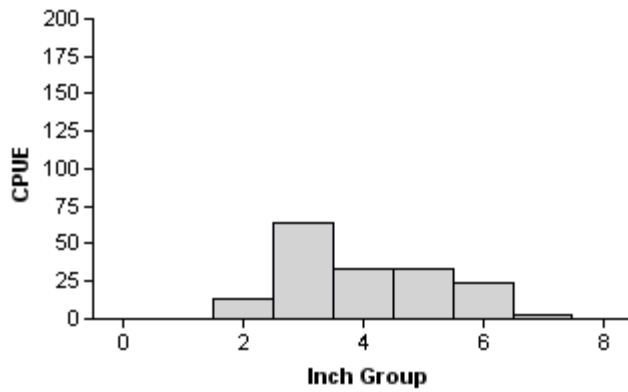


Figure 2. Number of gizzard shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Amon G. Carter Reservoir, Texas 2000, 2004, and 2008.

## Bluegill

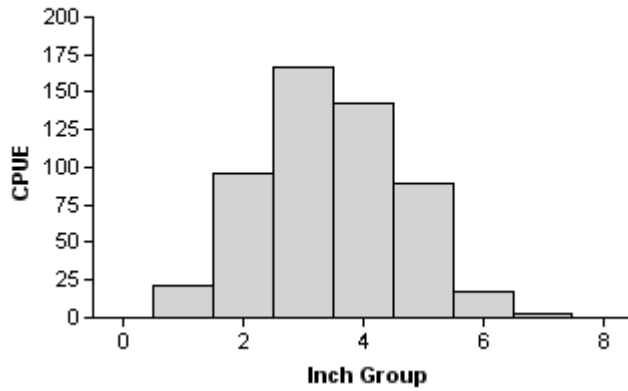
**2000**

Effort : 1.0  
Total CPUE : 172.0 (29; 172)  
PSD : 17 (6.3)



**2004**

Effort : 1.0  
Total CPUE : 537.0 (16; 537)  
PSD : 5 (1.1)



**2008**

Effort : 1.0  
Total CPUE : 305.0 (16; 305)  
PSD : 6 (1.4)

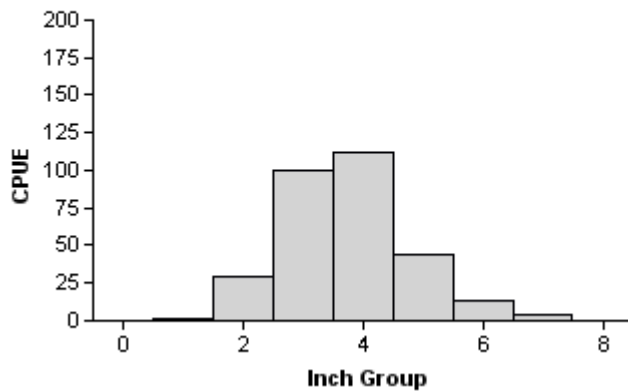
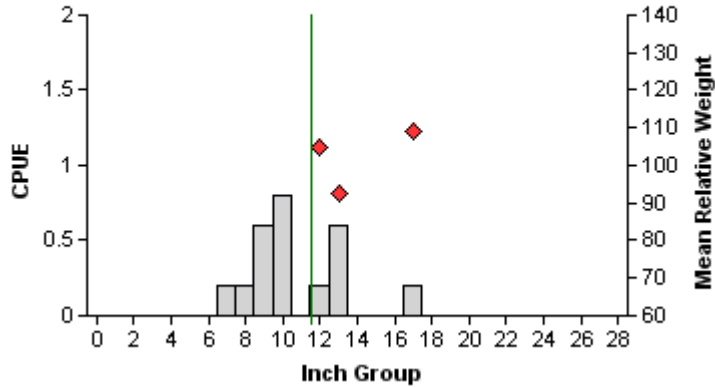


Figure 3. Number of bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Amon G. Carter Reservoir, Texas, 2000, 2004, and 2008.

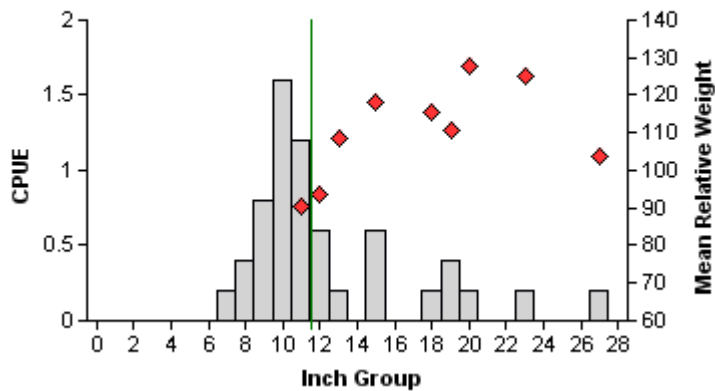
## Channel Catfish

2001



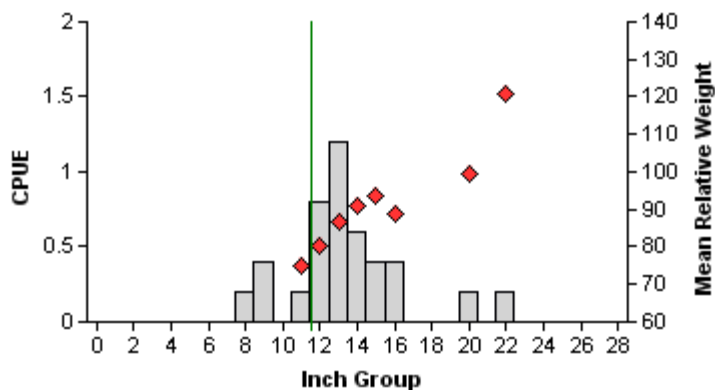
Effort : 5.0  
 Total CPUE : 2.8 (43; 14  
 Stock CPUE : 1.0 (55; 5  
 PSD : 20 (11

2005



Effort : 5.0  
 Total CPUE : 6.8 (36; 34  
 Stock CPUE : 3.8 (36; 19  
 PSD : 32 (9.5

2009



Effort : 5.0  
 Total CPUE : 4.6 (68; 23  
 Stock CPUE : 4.0 (70; 20  
 PSD : 20 (7.6

Figure 4. Number of channel catfish caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Amon G. Carter Reservoir, Texas, 2001, 2005, and 2009. Vertical lines represent length limit at time of collection.

Table 6. Creel survey statistics for channel catfish at Amon G. Carter Reservoir from December 2007 through November 2008, where total catch per hour is for anglers targeting channel catfish and total harvest is the estimated number of channel catfish harvested by all anglers. Relative standard errors are in parentheses.

| Creel Survey Statistic  | Year          |
|-------------------------|---------------|
|                         | 2007/2008     |
| Directed effort (h)     | 8,613.45 (15) |
| Directed effort(h)/acre | 4.66 (15)     |
| Total catch per hour    | 0.45 (42)     |
| Total harvest           | 3,794.35 (34) |
| Harvest/acre            | 2.05 (13)     |
| Percent legal released  | 6.23          |

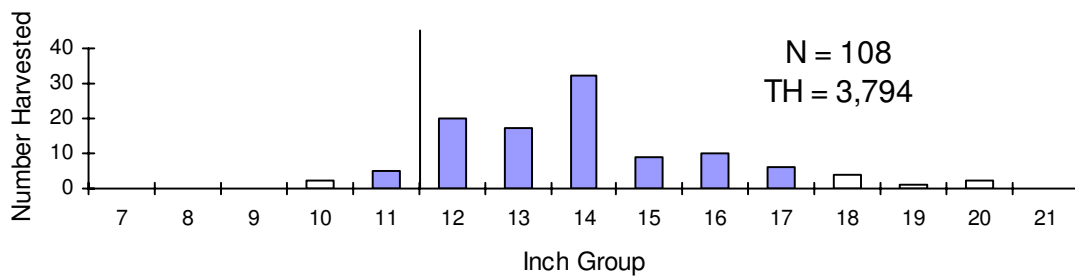
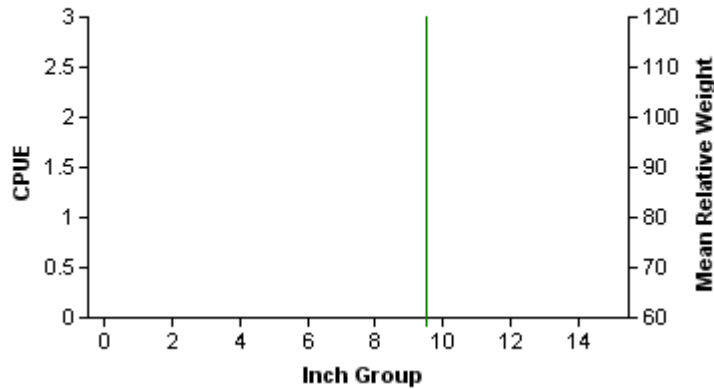


Figure 5. Length frequency of harvested channel catfish observed during creel surveys at Amon G. Carter Reservoir, Texas, December 2007 through November 2008, all anglers combined. N is the number of harvested channel catfish observed during creel surveys, and TH is the total estimated harvest for the creel period. Vertical line represents length limit at time of creel survey.

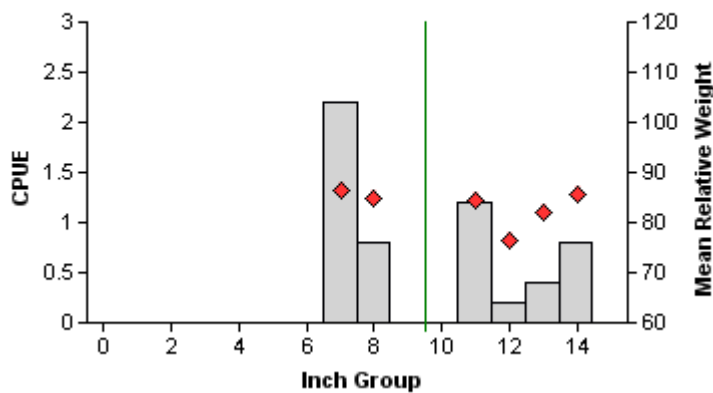
## White Bass

2001



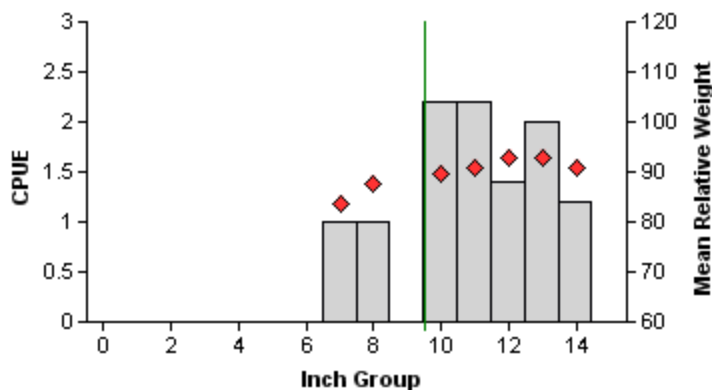
Effort : 5.0  
 Total CPUE : 0.0 (0; 0)  
 Stock CPUE : 0.0 (0; 0)  
 PSD : NA

2005



Effort : 5.0  
 Total CPUE : 5.6 (35; 28)  
 Stock CPUE : 5.6 (35; 28)  
 PSD : 46 (17.4)

2009



Effort : 5.0  
 Total CPUE : 11.0 (25; 55)  
 Stock CPUE : 11.0 (25; 55)  
 PSD : 82 (6.5)

Figure 6. Number of white bass caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring gill net surveys, Amon G. Carter Reservoir, Texas, 2001, 2005, and 2009. Vertical lines represent length limit at time of collection.



Table 7. Creel survey statistics for white bass at Amon G. Carter Reservoir from December 2007 through November 2008, where total catch per hour is for anglers targeting white bass and total harvest is the estimated number of white bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

| Creel Survey Statistic  | Year          |
|-------------------------|---------------|
|                         | 2007/2008     |
| Directed effort (h)     | 1,375.92 (31) |
| Directed effort(h)/acre | 0.74 (31)     |
| Total catch per hour    | 3.22 (54)     |
| Total harvest           | 5,482.14 (28) |
| Harvest/acre            | 2.97 (28)     |
| Percent legal released  | 27.04         |

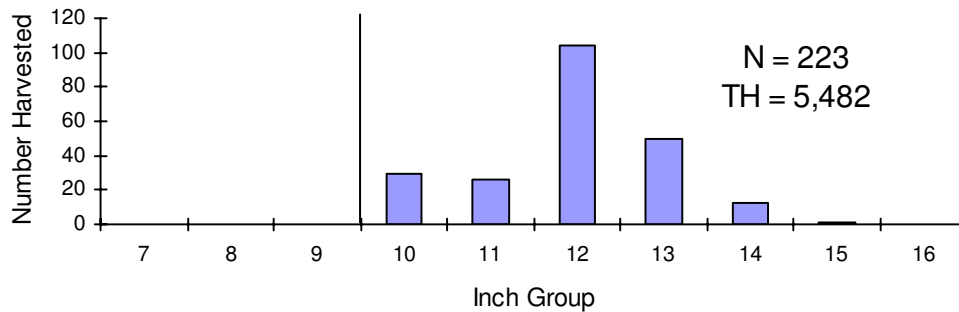


Figure 7. Length frequency of harvested white bass observed during creel surveys at Amon G. Carter Reservoir, Texas, December 2007 through November 2008, all anglers combined. N is the number of harvested white bass observed during creel surveys, and TH is the total estimated harvest for the creel period. Vertical line represents length limit at time of creel survey.

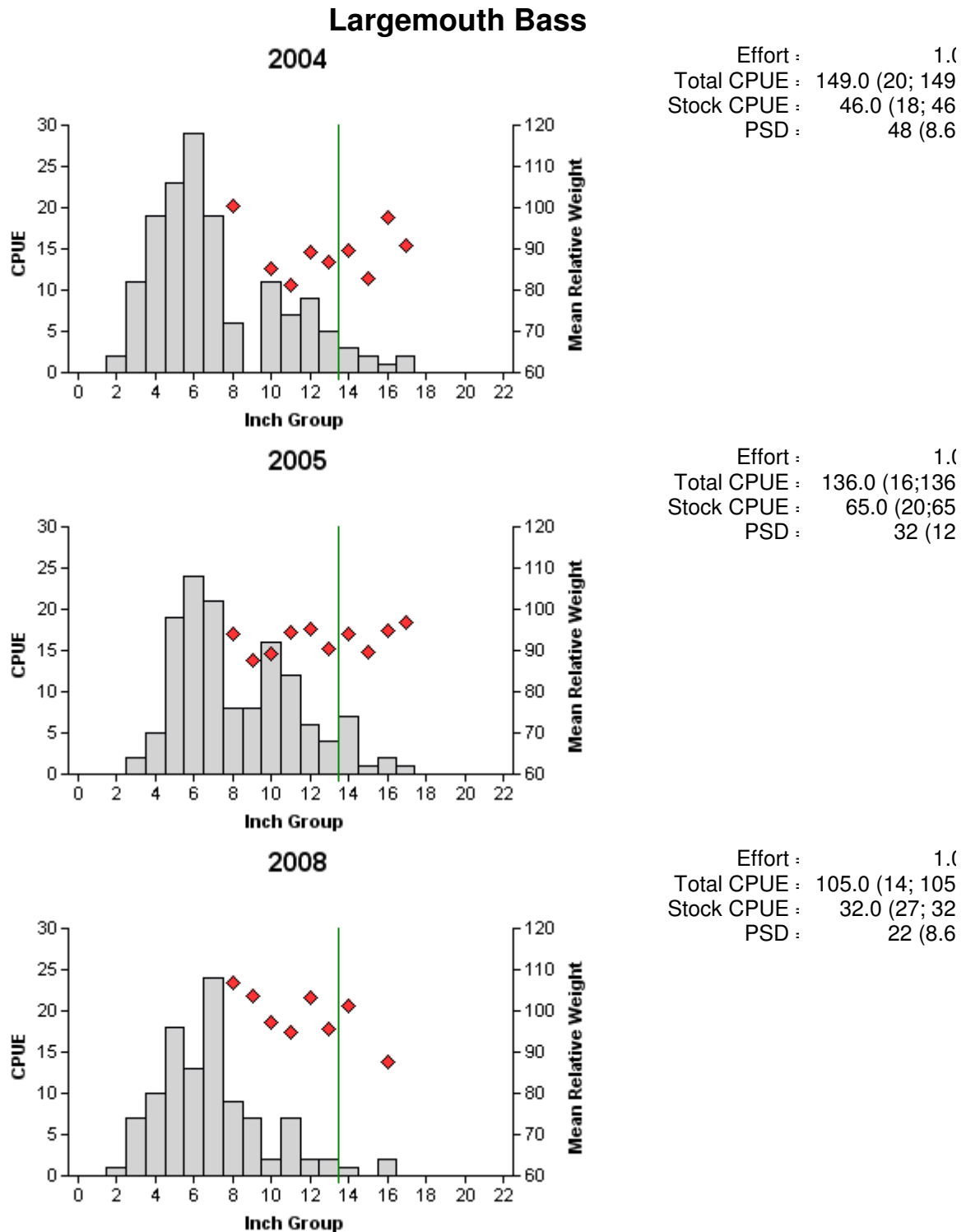


Figure 8. Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Amon G. Carter Reservoir, Texas, 2004, 2005, and 2008. Vertical lines represent length limit at time of collection.

Table 8. Creel survey statistics for largemouth bass at Amon G. Carter Reservoir from December 2007 through November 2008, where total catch per hour is for anglers targeting largemouth bass and total harvest is the estimated number of largemouth bass harvested by all anglers. Relative standard errors (RSE) are in parentheses.

| Creel Survey Statistic  | Year           |
|-------------------------|----------------|
|                         | 2007/2008      |
| Directed effort (h)     | 21,511.52 (15) |
| Directed effort(h)/acre | 11.64 (15)     |
| Total catch per hour    | 0.60 (14)      |
| Total harvest           | 2,810.76       |
| Harvest/acre            | 1.52           |
| Percent legal released  | 12.44          |

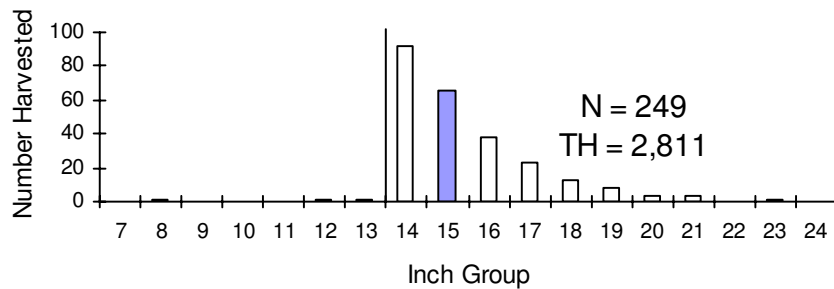
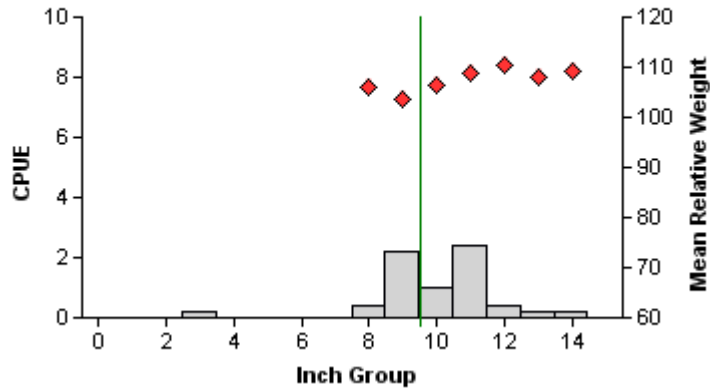


Figure 9. Length frequency of harvested largemouth bass observed during creel surveys at Amon G. Carter Reservoir, Texas, December 2007 through November 2008, all anglers combined. N is the number of harvested largemouth bass observed during creel surveys, and TH is the total estimated harvest for the creel period. Vertical line represents length limit at time of creel survey.

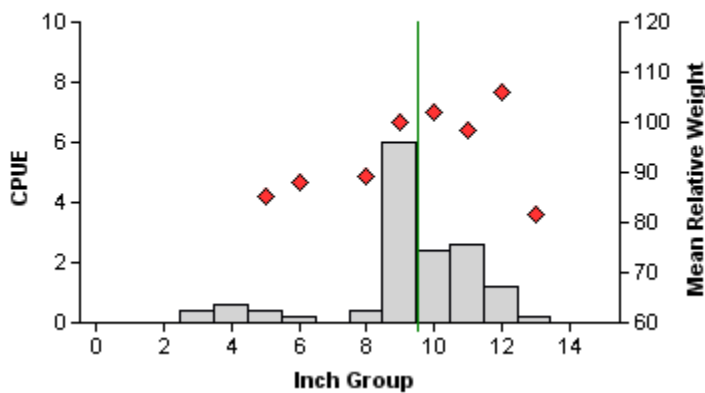
## White Crappie

2000



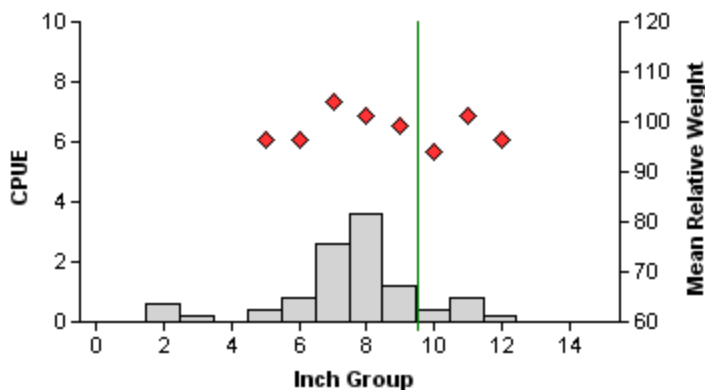
Effort : 5.0  
 Total CPUE : 7.0 (24; 35)  
 Stock CPUE : 6.8 (23; 34)  
 PSD : 100 (0)

2004



Effort : 5.0  
 Total CPUE : 14.4 (47; 72)  
 Stock CPUE : 13.4 (51; 67)  
 PSD : 96 (2.1)

2008



Effort : 5.0  
 Total CPUE : 10.8 (77; 54)  
 Stock CPUE : 10.0 (83; 50)  
 PSD : 62 (1.9)

Figure 10. Number of white crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Amon G. Carter Reservoir, Texas, 2000, 2004, and 2008. Vertical lines represent length limit at time of collection.

Table 9. Creel survey statistics for white crappie at Amon G. Carter Reservoir from December 2007 through November 2008, where total catch per hour is for anglers targeting crappie and total harvest is the estimated number of white crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

| Creel Survey Statistic                   | Year           |
|--|----------------|
|  | 2007/2008      |
| Directed effort (h) for crappie          | 8,741.17 (13)  |
| Directed effort(h)/acre for crappie      | 4.73 (13)      |
| Total catch per hour for crappie         | 4.10 (31)      |
| Total harvest for white crappie          | 12,368.00 (43) |
| Harvest/acre for white crappie           | 6.69 (43)      |
| Percent legal released for white crappie | 10.2           |

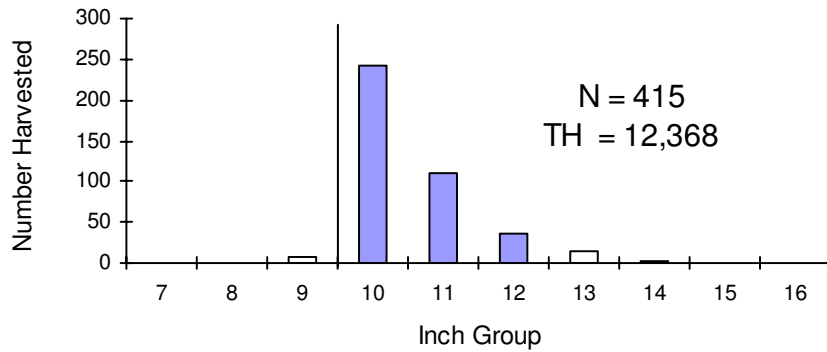
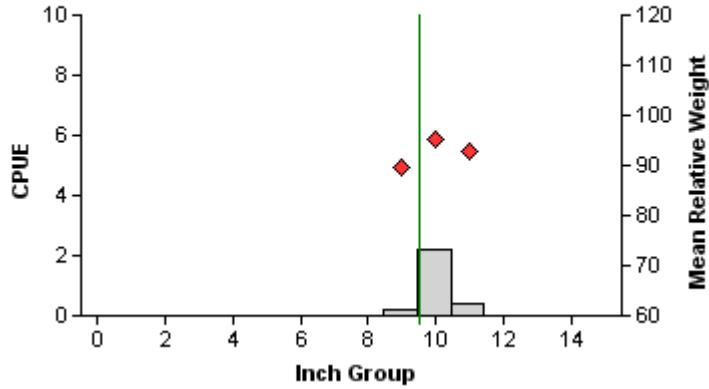


Figure 11. Length frequency of harvested white crappie observed during creel surveys at Amon G. Carter Reservoir, Texas, December 2007 through November 2008, all anglers combined. N is the number of harvested white crappie observed during creel surveys, and TH is the total estimated harvest for the creel period. Vertical line represents length limit at time of creel survey.

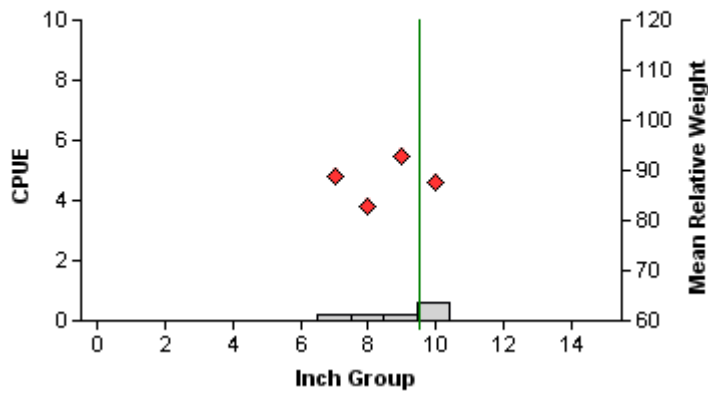
## Black Crappie

2000



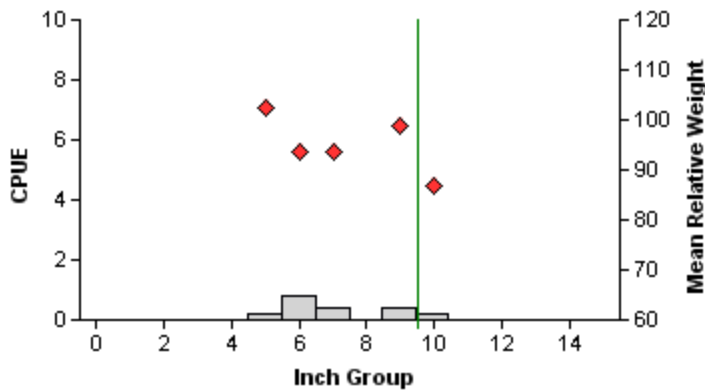
Effort : 5.0  
 Total CPUE : 2.8 (31; 14)  
 Stock CPUE : 2.8 (31; 14)  
 PSD : 100 (0)

2004



Effort : 5.0  
 Total CPUE : 1.2 (61; 6)  
 Stock CPUE : 1.2 (61; 6)  
 PSD : 83 (7.5)

2008



Effort : 5.0  
 Total CPUE : 2.0 (100; 10)  
 Stock CPUE : 2.0 (100; 10)  
 PSD : 30 (0)

Figure 12. Number of black crappie caught per net night (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall trap netting surveys, Amon G. Carter Reservoir, Texas, 2000, 2004, and 2008. Vertical lines represent length limit at time of collection.

Table 10. Creel survey statistics for black crappie at Amon G. Carter Reservoir from December 2007 through November 2008, where total catch per hour is for anglers targeting crappie and total harvest is the estimated number of black crappie harvested by all anglers. Relative standard errors (RSE) are in parentheses.

| Creel Survey Statistic                   | Year          |
|--|---------------|
|  | 2007/2008     |
| Directed effort (h) for crappie          | 8,741.17 (13) |
| Directed effort(h)/acre for crappie      | 4.73 (13)     |
| Total catch per hour for crappie         | 4.10 (31)     |
| Total harvest for black crappie          | 1,628.00 (68) |
| Harvest/acre for black crappie           | 0.88 (68)     |
| Percent legal released for black crappie | 0.0           |

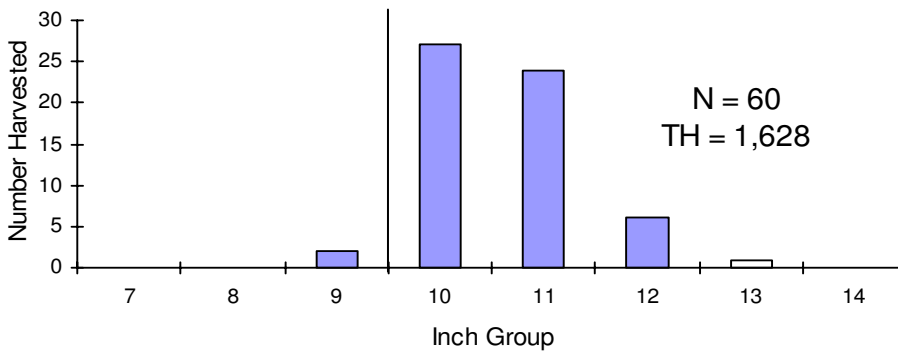


Figure 13. Length frequency of harvested black crappie observed during creel surveys at Amon G. Carter Reservoir, Texas, December 2007 through November 2008, all anglers combined. N is the number of harvested black crappie observed during creel surveys, and TH is the total estimated harvest for the creel period. Vertical line represents length limit at time of creel survey.

Table 11. Total fishing effort (h) for all species and total directed expenditures at Amon G. Carter Reservoir, Texas, December 2007 – November 2008.

| Creel Statistic             | Year      |
|-----------------------------|-----------|
|                             | 2007/2008 |
| Total fishing effort (h)    | 52,083    |
| Total directed expenditures | \$347,523 |

Table 12. Proposed sampling schedule for Amon G. Carter Reservoir, Texas. Electrofishing and trap netting surveys are conducted in the fall, while gill netting surveys are conducted during the following spring. Standard survey denoted by S and additional survey denoted by A.

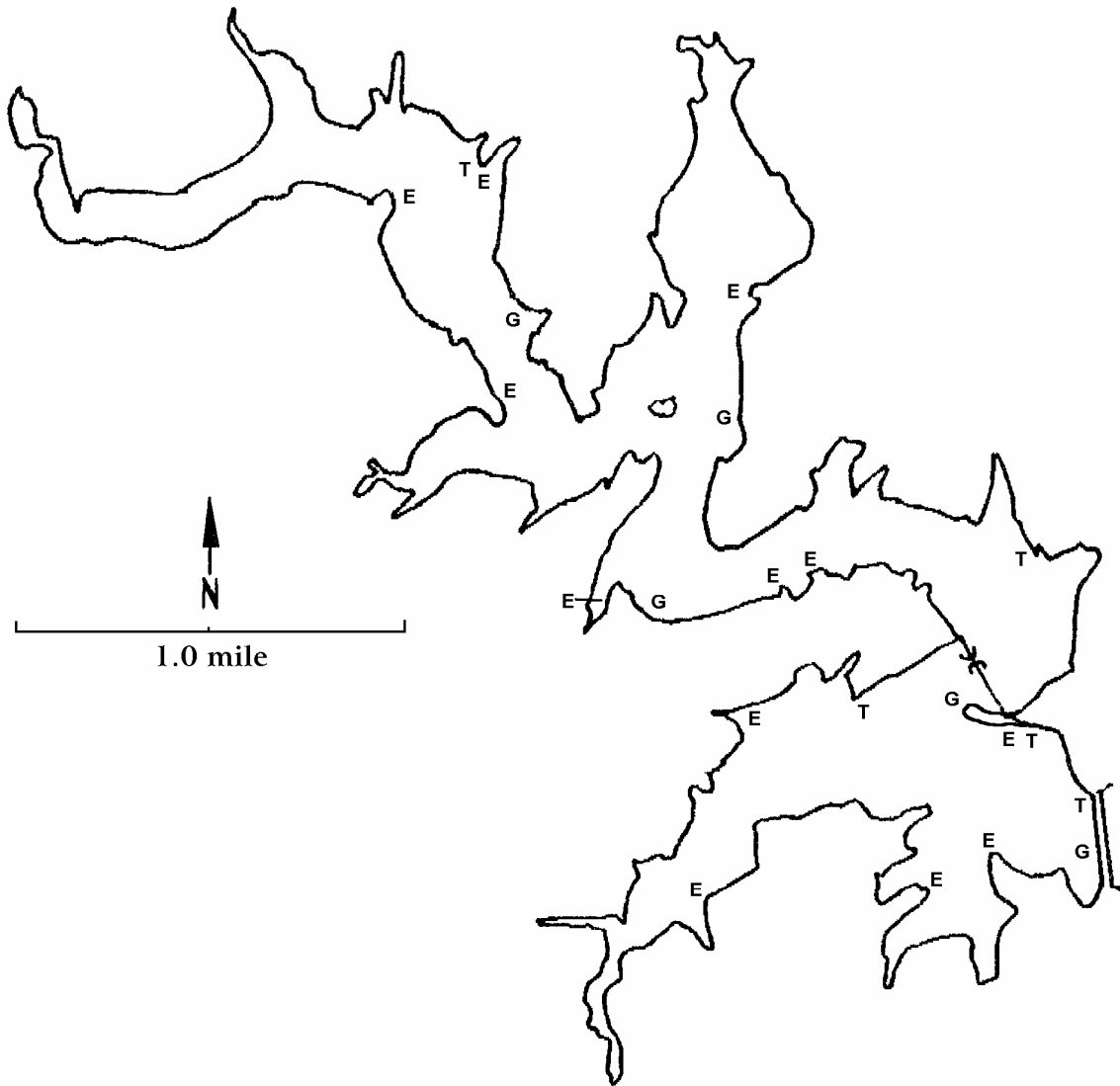
| Survey Year           | Electrofisher | Trap Net | Gill Net | Creel Survey | Report |
|-----------------------|---------------|----------|----------|--------------|--------|
| Fall 2009-Spring 2010 |               |          |          |              |        |
| Fall 2010-Spring 2011 |               |          |          |              |        |
| Fall 2011-Spring 2012 |               |          |          |              |        |
| Fall 2012-Spring 2013 | S             | S        | S        |              | S      |



**Appendix A**

Number (N) and catch rate (CPUE) of all target species collected from all gear types from Amon G. Carter Reservoir, Texas, 2008-2009.

| Species               | Gill Netting |      | Trap Netting |      | Electrofishing |       |
|-----------------------|--------------|------|--------------|------|----------------|-------|
|                       | N            | CPUE | N            | CPUE | N              | CPUE  |
| Gizzard shad          |              |      |              |      | 65             | 65.0  |
| Threadfin shad        |              |      |              |      | 575            | 575.0 |
| Channel catfish       | 23           | 4.6  |              |      |                |       |
| Flathead catfish      | 1            | 0.2  |              |      |                |       |
| White bass            | 55           | 11.0 |              |      |                |       |
| Green sunfish         |              |      |              |      | 34             | 34.0  |
| Warmouth              |              |      |              |      | 7              | 7.0   |
| Orangespotted sunfish |              |      |              |      | 1              | 1.0   |
| Bluegill              |              |      |              |      | 305            | 305.0 |
| Longear sunfish       |              |      |              |      | 105            | 105.0 |
| Redear sunfish        |              |      |              |      | 8              | 8.0   |
| Largemouth bass       |              |      |              |      | 105            | 105.0 |
| White crappie         |              |      | 54           | 10.8 |                |       |
| Black crappie         |              |      | 10           | 2.0  |                |       |

**Appendix B**

Location of sampling sites, Amon G. Carter Reservoir, Texas, 2008-2009. Trap netting, gill netting, and electrofishing are indicated by E, G, and T, respectively. Water level was 1.6 feet below conservation level for electrofishing, 2.96 feet below conservation level for gill netting, and 1.8 feet below conservation level during trap netting.

## Appendix C

Catch rates (CPUE) of targeted species by gear type for Amon G. Carter Reservoir, Texas, 1992, 1995, 1998, 2000, 2001, 2002, 2004, 2005, 2008, and 2009.

| Gear                         | Species               | Year              |                   |                   |                   |                   |                     |                   |                     |                     |                   |
|------------------------------|-----------------------|-------------------|-------------------|-------------------|-------------------|-------------------|---------------------|-------------------|---------------------|---------------------|-------------------|
|                              |                       | 1992 <sub>a</sub> | 1995 <sub>a</sub> | 1998 <sub>b</sub> | 2000 <sub>b</sub> | 2001 <sub>b</sub> | 2002 <sub>b,c</sub> | 2004 <sub>b</sub> | 2005 <sub>b,c</sub> | 2008 <sub>b,d</sub> | 2009 <sub>b</sub> |
| Gill Net<br>(fish/net night) | Channel catfish       | 8.8               | 11.6              | 2.4               |                   | 2.8               |                     |                   | 6.8                 |                     | 4.6               |
|                              | Flathead catfish      | 0.0               | 0.4               | 0.0               |                   | 0.0               |                     |                   | 0.4                 |                     | 0.2               |
|                              | White bass            | 0.0               | 0.8               | 3.8               |                   | 0.0               |                     |                   | 5.6                 |                     | 11.0              |
| Electrofisher<br>(fish/hour) | Gizzard shad          | 304.0             | 184.7             | 468.7             | 111.0             |                   |                     | 709.0             |                     | 65.0                |                   |
|                              | Threadfin shad        | 83.3              | 392.0             | 183.3             | 125.0             |                   |                     | 219.0             |                     | 575.0               |                   |
|                              | Green sunfish         | 32.0              | 254.3             | 14.0              | 31.0              |                   |                     | 102.0             |                     | 34.0                |                   |
|                              | Warmouth              | 9.3               | 60.7              | 18.0              | 2.0               |                   |                     | 11.0              |                     | 7.0                 |                   |
|                              | Orangespotted sunfish | 0.0               | 0.0               | 0.0               | 0.0               |                   |                     | 0.0               |                     | 1.0                 |                   |
|                              | Bluegill              | 110.7             | 219.3             | 222.7             | 172.0             |                   |                     | 537.0             |                     | 305.0               |                   |
|                              | Longear sunfish       | 130.0             | 152.0             | 108.0             | 44.0              |                   |                     | 242.0             |                     | 105.0               |                   |
|                              | Redear sunfish        | 3.3               | 1.3               | 2.0               | 9.0               |                   |                     | 6.0               |                     | 8.0                 |                   |
|                              | Largemouth bass       | 112.0             | 184.0             | 130.7             | 36.0              |                   | 54.0                | 149.0             | 136.0               | 105.0               |                   |
| Trap Net<br>(fish/net night) | White crappie         | 12.9              | 11.5              | 5.2               | 7.0               |                   |                     | 14.4              |                     | 10.8                |                   |
|                              | Black crappie         | 0.0               | 0.5               | 0.2               | 2.8               |                   |                     | 1.2               |                     | 2.0                 |                   |

<sub>a</sub> All sampling stations for all gear were subjectively selected.

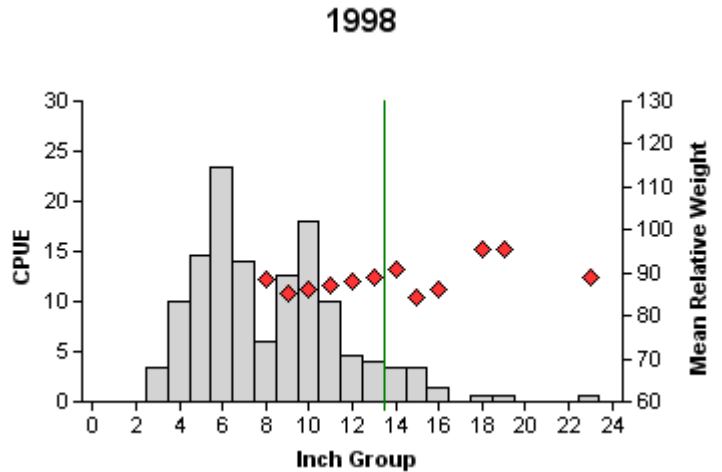
<sub>b</sub> All sampling stations for all gear were randomly selected.

<sub>c</sub> Bass-only electrofishing survey.

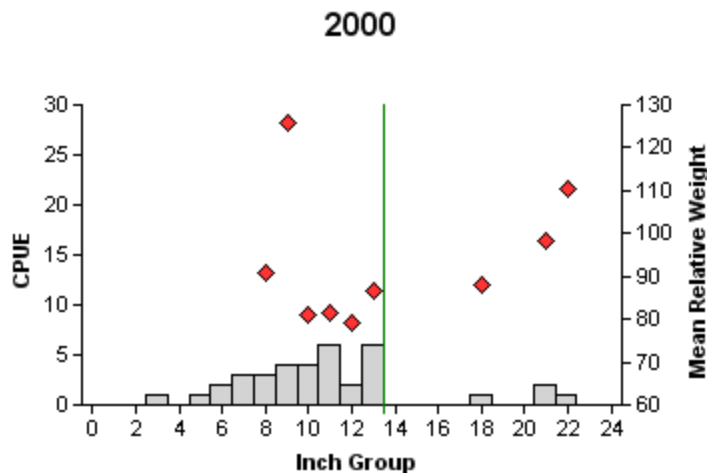
<sub>d</sub> Electrofishing survey was conducted using a 7.5 Smith-Root GPP (Gas Powered Pulsator). Electrofishing surveys prior to 2007 were conducted using a Smith-Root 5.0 GPP.

### Appendix D

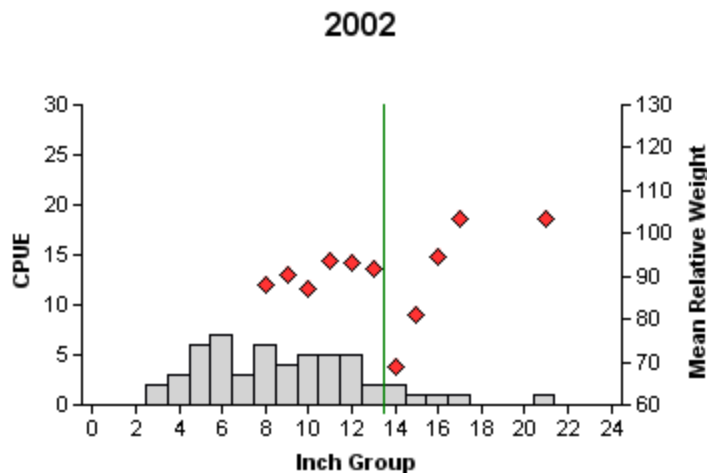
Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing survey, Amon G. Carter Reservoir, Texas, 1998, 2000, and 2002. Vertical line represents length limit at time of collection.



Effort : 1.0  
 Total CPUE : 130.7 (15; 196)  
 Stock CPUE : 65.3 (21; 98)  
 PSD : 29 (12.4)



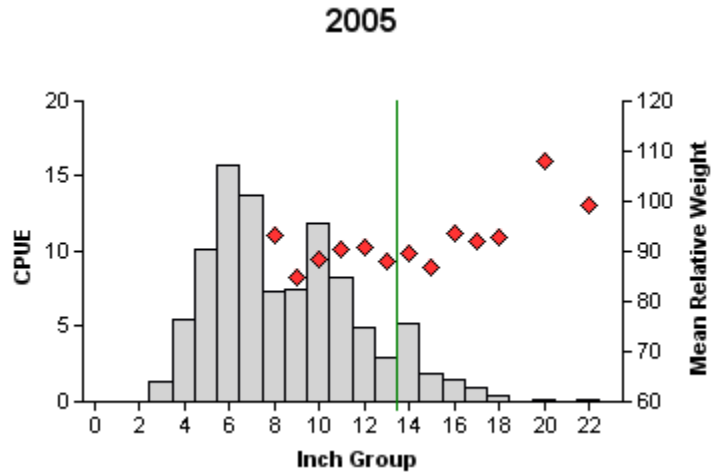
Effort : 1.0  
 Total CPUE : 36.0 (27; 36)  
 Stock CPUE : 29.0 (29; 29)  
 PSD : 41 (8.4)



Effort : 1.0  
 Total CPUE : 54.0 (13; 54)  
 Stock CPUE : 33.0 (16; 33)  
 PSD : 39 (8.4)

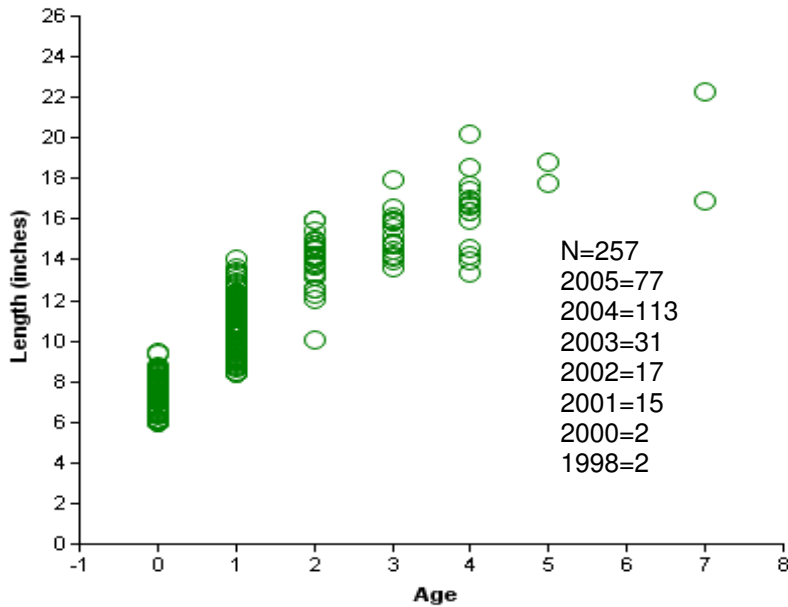
### Appendix E

Number of largemouth bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing survey, Amon G. Carter Reservoir, Texas, 2005. Vertical line represents length limit at time of collection.



|                          |                |
|--------------------------|----------------|
| Effort :                 | 5.1            |
| Total CPUE :             | 99.4 (17; 530) |
| Stock CPUE :             | 53.1 (20; 283) |
| PSD :                    | 34 (3.7)       |
| Total Annual Mortality : | 63%            |

Length-at-age for largemouth bass collected from electrofishing at Amon G. Carter Reservoir, Texas, November 2005.



**Appendix F**

Number of largemouth bass (bars) double tagged for largemouth bass tournament exploitation study during electrofishing, Amon G. Carter Reservoir, Texas, October-November, 2007.

